

PATENT CLAIMS

1. Composition for preparing poly(meth)acrylimides  
and for producing poly(meth)acrylimide foams,  
5 according to Figure 5,

characterized in that

10 methacrylic anhydride and one, or two or more  
different, N-methacrylamides [sic]  $C_4H_6NOR^1$  accord-  
ing to Figure 6, and/or one, or two or more  
different, primary amines  $H_2NR^1$  was added to the  
composition, where  $R^1$  or  $R^2$  [sic] may be identical  
15 or different and are an alkyl or aryl radical  
which has up to 36 carbon atoms and in which  
oxygen atoms, nitrogen atoms, sulphur atoms, and  
phosphorus atoms in the form of organic  
functionalities, e.g. an ether function, alcohol  
function, acid function, ester function, amide  
20 function, imide function, phosphonic acid  
function, phosphonic ester, phosphinic acid  
function, phosphinic ester function, sulphonic  
acid function, sulphonic ester function, sulphonic  
acid function, sulphonic ester function, silicon  
25 atoms, aluminium atoms and boron atoms, or else  
halogens, such as fluorine, chlorine, bromine or  
iodine may also be present,  $R^1$  and  $R^2$  may be the  
methyl group, the ethyl group, the n-propyl group,  
2-propyl group, n-butyl group, 2-butyl group,  
30 3-methyl-2-butyl group, tert-butyl group, the  
isomers of the propyl, hexyl, heptyl group, the  
isomers of the octyl group, e.g. the 2-ethylhexyl  
group, the lauryl group, stearyl group, the phenyl  
group, benzyl group, alkylphenyl group,  
35 alkylbenzyl group,  $R^3-PO(OR^3)_2$  group, where  $R^3$  is  
an alkyl or aryl radical having up to 20 carbon  
atoms.

2. Composition according to Claim 1, characterized in

that the composition comprises a blowing agent which is preferably an aliphatic alcohol having from 3 to 8 carbon atoms, urea, monomethyl- and/or N,N'-dimethylurea and/or formamide and/or water.

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3. Process for producing a polymethacrylimide foam, characterized in that a mixture composed of

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(A) from 0.7 to 1.3 molar parts of one or more primary amines  $H_2NR^1$ , where  $R^1$  is as described above,

from 0.7 to 1.3 molar parts of methacrylic anhydride;

(B) from 0.3 to 2.0 molar parts of methacrylonitrile,

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from 0.7 to 2.5 molar parts of methacrylic acid and

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from 0 to 0.2 molar part of other monomers having vinyl unsaturation, where the ratio of the total of the molar parts of (B) and (A) is  $(B)/(A) =$  from 0 to 1 million;

(C) from 0.5 to 15 per cent by weight, based on the total of the weights of components (A) and (B), of a blowing agent;

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(D) from 0.01 to 0.5 per cent by weight, based on the total of the weights of components (A) and (B), of one or more polymerization initiators;

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(E) from 0 to 200 per cent by weight, based on the total of the weights of components (A) and (B), of conventional additives

is polymerized to give a sheet, and then this polymer sheet is foamed at temperatures of from 150 to 250°C.

4. Process for producing a polymethacrylimide foam, characterized in that a mixture composed of

5 (A) from 0.7 to 1.3 molar parts of one or more primary amines  $H_2NR^1$ , where  $R^1$  is as described above,

from 1.4 to 2.6 molar parts of methacrylic anhydride,

10 from 1.4 to 2.6 molar parts of methacrylonitrile;

(B) from 0.3 to 2.0 molar parts of methacrylonitrile,

from 0.7 to 2.5 molar parts of methacrylic acid and

15 from 0 to 0.2 molar part of other monomers having vinyl unsaturation, where the ratio of the total of the molar parts of (B) and (A) is  $(B)/(A) =$  from 0 to 1 million;

20 (C) from 0.5 to 15 per cent by weight, based on the total of the weights of components (A) and (B), of a blowing agent;

25 (D) from 0.01 to 0.5 per cent by weight, based on the total of the weights of components (A) and (B), of one or more polymerization initiators;

(E) from 0 to 200 per cent by weight, based on the total of the weights of components (A) and (B), of conventional additives

30 is polymerized to give a sheet, and then this polymer sheet is foamed at temperatures of from 150 to 250°C.

5. Process for producing a polymethacrylimide foam, characterized in that a mixture composed of

5 (A) from  $10^{-7}$  to 1.3 molar parts of one or more N-methacrylamides [sic]  $C_4H_6NOR^1$  according to Figure 6, where  $R^1$  is as described above,

from 0.7 to 1.3 molar parts of methacrylic anhydride,

10 from  $10^{-7}$  to 1.3 molar parts of methacrylonitrile, where the total of the molar parts of methacrylonitrile and of the N-methacrylamide is from 0.7 to 1.3 molar parts;

15 (B) from 0 to 0.2 molar part of other monomers having vinyl unsaturation, where the ratio of the total of the molar parts of (B) and (A) is  $(B)/(A) =$  from 0 to 1 million;

20 (C) from 0.5 to 15 per cent by weight, based on the total of the weights of components (A) and (B), of a blowing agent;

(D) from 0.01 to 0.5 per cent by weight, based on the total of the weights of components (A) and (B), of one or more polymerization initiators;

25 (E) from 0 to 200 per cent by weight, based on the total of the weights of components (A) and (B), of conventional additives

30 is polymerized to give a sheet, and then this polymer sheet is foamed at temperatures of from 150 to 250°C.

6. Process for producing a polymethacrylimide foam, characterized in that a mixture composed of

- (A) from 0.7 to 1.3 molar parts of one or more N-methacrylamides [sic]  $C_4H_6NOR^1$  according to Figure 6, where  $R^1$  is as described above,
- 5 from 0.7 to 1.3 molar parts of methacrylic anhydride,
- from 0.7 to 1.3 molar parts of methacrylonitrile;
- (B) from 0.3 to 2.0 molar parts of methacrylonitrile,
- 10 from 0.7 to 2.5 molar parts of methacrylic acid and
- from 0 to 0.2 molar part of other monomers having vinyl unsaturation, where the ratio of the total of the molar parts of (B) and (A) is  $(B)/(A) =$  from 0 to 1 million;
- 15 (C) from 0.5 to 15 per cent by weight, based on the total of the weights of components (A) and (B), of a blowing agent;
- (D) from 0.01 to 0.5 per cent by weight, based on the total of the weights of components (A) and (B), of one or more polymerization initiators;
- 20 (E) from 0 to 200 per cent by weight, based on the total of the weights of components (A) and (B), of conventional additives
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- is polymerized to give a sheet, and then this polymer sheet is foamed at temperatures of from 150 to 250°C.
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7. Process for producing a polymethacrylimide foam, characterized in that a mixture composed of

- (A) from 0 to 2.6 molar parts of one or more primary amines  $\text{H}_2\text{NR}^1$ , where  $\text{R}^1$  is as described above,
- 5 from 0 to 5.2 molar parts of one or more N-methacrylamides [sic]  $\text{C}_4\text{H}_6\text{NOR}^1$  according to Figure 6, where  $\text{R}^1$  is as described above,
- 10 from >0 to 6.5 molar parts of methacrylic anhydride,
- from 0 to 3.9 molar parts of methacrylonitrile and
- from 0 to 1.3 molar parts of methacrylic acid;
- 15 (B) from 0.3 to 2.0 molar parts of methacrylonitrile,
- from 0.7 to 2.5 molar parts of methacrylic acid and
- 20 from 0 to 0.2 molar part of other monomers having vinyl unsaturation, where the ratio of the total of the molar parts of (B) and (A) is  $(\text{B})/(\text{A}) =$  from 0 to 1 million;
- (C) from 0.5 to 15 per cent by weight, based on the total of the weights of components (A) and (B), of a blowing agent;
- 25 (D) from 0.01 to 0.5 per cent by weight, based on the total of the weights of components (A) and (B), of one or more polymerization initiators;
- 30 (E) from 0 to 200 per cent by weight, based on the total of the weights of components (A) and (B), of conventional additives

is polymerized to give a sheet, and then this polymer sheet is foamed at temperatures of from 150 to 250°C.

- 5    8.    Process according to any of Claims 3 to 7,  
characterized in that the blowing agent used  
comprises an aliphatic alcohol having from 3 to  
8 carbon atoms, urea, monomethyl- and/or  
N,N'-dimethylurea and/or formamide and/or water.
- 10    9.    Laminate comprising a layer of a poly(meth)acryl-  
imide foam according to any of Claims 1 to 8.
- 15    10.   Automobile characterized in that it is composed  
entirely or partially of a poly(meth)acrylimide  
foam according to at least one of the preceding  
claims.
- 20    11.   Rail vehicle characterized in that it is composed  
entirely or partially of a poly(meth)acrylimide  
foam according to at least one of the preceding  
claims.
- 25    12.   Watercraft characterized in that it is composed  
entirely or partially of a poly(meth)acrylimide  
foam according to at least one of the preceding  
claims.
- 30    13.   Rotor characterized in that it is composed  
entirely or partially of a poly(meth)acrylimide  
foam according to at least one of the preceding  
claims.